

Claims

- [c1] An apparatus for processing a substrate with a plasma, comprising:
- a first electrode;
 - a second electrode positioned with a spaced apart relationship relative to said first electrode;
 - a separating ring for forming a vacuum-tight seal between said first electrode and said second electrode and defining an evacuable processing region between said first electrode and said second electrode, said first electrode adapted to support the substrate in said processing region for plasma processing, and said separating ring electrically isolating said first electrode from said second electrode;
 - a process gas port for introducing a process gas to said processing region; and
 - a vacuum port for evacuating said processing region to a pressure suitable for generating the plasma from the process gas in said processing region.
- [c2] The apparatus of claim 1 further comprising:
- a vacuum manifold coupled with said vacuum port, said vacuum manifold being electrically isolated from said

first electrode and said second electrode.

- [c3] The apparatus of claim 2 wherein said vacuum manifold includes an enclosed volume proximate to said vacuum port and further comprising:
an insert of an electrically insulating material positioned inside said enclosed volume, said insert including a first plurality of passages coupling said vacuum manifold with said vacuum port.
- [c4] The apparatus of claim 3 wherein said vacuum port is defined by a second plurality of passages extending through said first electrode and registered with said first plurality of passages.
- [c5] The apparatus of claim 1 further comprising:
a vacuum pump coupled with said vacuum port and operative for evacuating said processing region to said pressure suitable for generating the plasma from the process gas in said processing region.
- [c6] The apparatus of claim 1 further comprising:
a process gas supply coupled with said process gas port for introducing the process gas to said processing region.
- [c7] The apparatus of claim 1 wherein said second electrode includes a plurality of openings arranged in a pattern ef-

fective for communicating process gas from said process gas port to said processing region.

[c8] The apparatus of claim 1 further comprising a substrate holder positioned inside said processing region and configured to support the substrate on said first electrode.

[c9] The apparatus of claim 8 wherein said substrate holder is electrically coupled with said first electrode.

[c10] The apparatus of claim 1 further comprising:
an electrically-conductive enclosure surrounding said separating ring, said first electrode, and said second electrode, said first electrode and said second electrode each separated from said conductive enclosure by an air gap.

[c11] The apparatus of claim 10 wherein said enclosure includes a base and a lid movable relative to said lid between opened and closed positions for accessing said processing region, said lid carrying said first electrode for movement relative to said base.

[c12] The apparatus of claim 10 further comprising a coolant port in said lid for supplying a flow of a coolant fluid to said air gap for cooling said first electrode and said second electrode.

- [c13] The apparatus of claim 1 wherein said first electrode includes said vacuum port and said second electrode includes said process gas port.
- [c14] The apparatus of claim 13 wherein said second electrode includes a plurality of gas openings coupled with said process gas port, said plurality of gas openings positioned in said second electrode to distribute process gas across a confronting surface of the substrate.
- [c15] An apparatus for plasma processing a plurality of substrates, comprising:
- a first electrode;
 - a second electrode positioned with a spaced apart relationship relative to said first electrode;
 - a third electrode positioned between said first electrode and said second electrode;
 - a first separating ring for forming a vacuum-tight seal between said first electrode and said third electrode and defining a first evacuable processing region between said first electrode and said third electrode, said first electrode adapted to support one of the plurality of substrates in said first processing region for plasma processing, and said first separating ring electrically isolating said first electrode from said third electrode;
 - a second separating ring for forming a vacuum-tight seal between said second electrode and said third electrode

to define a second evaluable processing region between said second electrode and said third electrode, said third electrode adapted to support one of the plurality of substrates in said second processing region for plasma processing, and said second separating ring electrically isolating said second electrode from said third electrode; at least one process gas port for introducing a process gas to said first processing region and second processing region; and a vacuum port for evacuating said processing region to a pressure suitable for generating the plasma from the process gas in said first processing region and said second processing space.

[c16] The apparatus of claim 15 wherein said vacuum port is defined in said second electrode.

[c17] The apparatus of claim 16 wherein said first electrode includes a first process gas port for introducing the process gas to said first processing region and said third electrode includes a second process gas port for introducing the process gas to said second process region.